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MINERAL STAIN IN HARD MAPLES AND OTHER HARDWOODS

Reserve
aTA422
S34
1954

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Both the heartwood and the sapwood of living hard maple trees, and to some extent of other hardwoods, of the Lake States and northeastern forests commonly are disfigured by deep olive or greenish black discolorations generally known as mineral stain or mineral streak. These may appear on sawed materials as individual lenticular streaks of various lengths paralleling the grain or as mass discolorations. On specimens observed the latter form has been more prevalent in or near the heartwood. During seasoning both the streaked and the mass-stained wood have a pronounced tendency to crack open along areas where the discoloration is deepest. The defect is an important factor in the utilization of species affected. It not only results in serious degrade but, because of its variable occurrence, often within comparatively limited areas, also tends to be a source of objectionable error in stumpage evaluations.

The terms mineral stain and mineral streak probably originated at the sawmill, since it is a common belief among those engaged in lumber manufacture that the discolorations are associated with accumulations of mineral matter. Such a presumption arises from the report that the stained wood dulls saws and planer knives more rapidly than bright wood. A recent preliminary study of the chemical composition and hardness of mineral-stained maple indicates that the popular conceptions in these respects have some foundation in fact.

A 30 percent solution of hydrochloric acid caused a pronounced effervescence at most stained areas to which it was applied, indicating the probable presence of carbonates in abnormal quantities. Effervescence from mass discolorations was not observed so regularly as from streaked areas but nevertheless almost always occurred at points where checking had taken place. The gas appeared to emerge mainly from vessel openings. No evolution of carbon dioxide from bright wood of the same boards could be detected, even with the aid of a microscope.

The ash content of mineral-stained wood, as determined by incineration of splinters dissected from the discolored areas, was without exception considerably greater than that of bright wood removed from adjacent areas. The former averaged 5.2 percent as against 1.2 percent for the latter.

¹Maintained at Madison, Wis., in cooperation with the University of Wisconsin.

*Observed
See Shiga
(Ref. in FPL 248)*

Forty-seven tests were made of the hardness of streaked and longitudinally adjacent bright wood, using the ball-penetration method employed at the Forest Products Laboratory. A good estimate of the relative hardness of mass discolorations could not be obtained because of difficulty in getting bright wood suitable for comparison in the same samples. The average ratio of hardness of streaked to bright wood was approximately 103/100. Although this difference is small, it is regarded as a true one. Mathematical analysis of the data discloses odds of better than 250 to 1 against the occurrence of an equal or greater difference simply as a result of accidental variations in hardness. Whether an increase in hardness of no more than 3 percent would have a noticeable effect on saw teeth and planer knives is problematical; however, it is recognized that other mechanical properties than hardness are involved in the resistance of wood to cutting.

Because of its importance, mineral stain warrants more attention than it has received hertofore. Nothing definite is known regarding its cause; consequently possibilities of limiting its occurrence are yet to be ascertained. Although a large number of stained maple specimens have been examined both culturally and microscopically for the presence of organisms, no fungus has been found consistently enough to be regarded as a possible causal agent. In fact, no fungi were found in over 50 percent of recently examined cases. There is, of course, the possibility that bacteria may be involved. This would require somewhat different technique to investigate adequately. From the evidence so far accumulated, it appears that the discolorations may be initiated by generally obscure injuries, which in some way interfere with normal physiological processes of the surrounding cells, and that although fungi occasionally may be present they are not necessarily a contributing factor. Commonly discolorations identical with those described can be definitely traced to bird pecks and similar wounds; discolorations similar in appearance regularly result from tapping operations for maple sap.² Stained zones are found in both the heartwood and sapwood; however, if they are formed purely as a result of physiological disturbances, their maximum development necessarily would be reached in the sapwood. The discoloration seems to spread mainly in the ray cells and vessels, which ultimately contain dark globular masses of the material directly responsible for the color.

Information Reviewed and Reaffirmed
April 1954

²Murphey, F. T. The maple syrup crop. Penna. Agric. Exp. Sta. Cir. 186. 1937.

